

**DELPHI, ORNL AND DOE SUCCESSFULLY IMPLEMENT
NEW ENERGY SAVING
NICKEL ALUMINIDE HEAT-TREAT FURNACE TECHNOLOGY**

Delphi, ORNL, and OIT have been working together on Ni₃Al fixtures for furnaces since the initial Cooperative Research and Development Agreement in 1992. The research and development has focused on Nickel aluminide alloys including alloy development, and welding, melting and casting technologies. The research and development (R&D) is sponsored by the Industrial Materials for the Future (IMF) Program, Office of Industrial Technologies, Energy Efficiency and Renewable Energy, and also based on research and development funded by the Office of Science, U. S. Department of Energy.

Delphi is currently in the process of changing all of the fixtures used in their carburizing furnaces to Ni₃Al fixtures. This means that initially over 500 fixtures are being cast and are in the process of being installed. The carburizing furnaces are very large gas fired systems (about 150 ft long) and heat treat hundreds of tons of steel per day. The Ni₃Al fixtures last from 3-5 times longer than current high performance steel alloys; and are at least 3 times stronger at operating temperature than conventional alloys. These properties are enabling improved energy and production efficiencies of up to 33%. The use of the stronger Ni₃Al fixtures enabled Delphi to meet production goals by building only two new furnaces instead of the three which would have been required with current technology fixtures.

Delphi, Saginaw, MI hosted the "Success" event on April 30, 2001 at the Delphi, Saginaw, MI plant site to highlight the commercialization and use of Ni₃Al fixtures in their steel carburizing heat treating furnaces. The technology was also identified as the one technology of R&D efforts funded at ORNL by the Office of Industrial Technology to be showcased during a recent visit to ORNL of the Secretary of Energy, U. S. Representatives, and U. S. Senator from Tennessee.

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Personnel who participated included:

Delphi:
Paul Tosch President of Delphi Saginaw Division
Larry Tomzal Director of Engineering
Nady Boules Director of Research
Madhu Chatterjee, technical staff and

Beth Bernthal, Director of Public Relations

U. S. DOE

Denise Swink, Director, Office of Industrial Technologies (OIT)

Charles Sorrell, Program Manager, Industrial Materials for the Future, OIT

Mike Soboroff, Program Manager, Industrial Materials for the Future, OIT

ORNL

Everett Bloom, Director, Metals and Ceramics Division

Peter Angelini, Project Manager, Industrial Materials for the Future

Vinod Sikka, Group Leader, metals and Ceramics Division

The schedule of events included:

April 30, 2001

12:00 Introductions

12:20-1:30 Formal Lunch (all)

1:30-1:45 Nickel aluminide applications & experience at Delphi - Delphi

1:45-2:00 Introductions about Delphi/ORNL/DOE activities on nickel aluminides -

ORNL

2:00-2:15 OIT perspective, Denise Swink and Charlie Sorrell

2:15-3:15 Plant tours

3:15-3:45 Publicity/News Conference

3:45 Adjourn

The following is from the Press release:

– Delphi Automotive Systems (NYSE: DPH), Troy, Mich., Oak Ridge National Laboratory, and the Department of Energy (DOE) celebrated the successful implementation of nickel aluminide (Ni_3Al) heat-treat fixtures developed jointly under a cooperative research and development agreement (CRADA). The development enables a more energy-efficient manufacturing process for Delphi and other U.S. manufacturers who have similar needs, thereby helping the DOE to meet the goals of the National Energy Strategy, an initiative to improve energy efficiency, decrease industrial process waste and improve worldwide competitiveness.

“We are pleased to have worked with Delphi, leveraging the strengths of industry and government, to develop this technology for a win-win application,” said Denise Swink, deputy assistant secretary for industrial technologies, DOE, Office of Industrial Technologies (OIT). “The commercialization of nickel aluminide for heating trays and fixtures will clearly give the United States a lead position in the world with now-proven, advanced materials for these types of applications.”

The DOE’s Oak Ridge National Laboratory (ORNL) researchers invented the nickel aluminide alloy in an effort to develop heat resistant. The alloy has a highly ordered structure, which contributes to an unusual property where the alloy gets stronger as it is heated to around 900 degrees centigrade.

“Delphi is one of the largest heat treating facilities in the world so it was of great interest to us to develop the nickel alloy further in partnership with the DOE,” stated Paul J. Tosch, president of Delphi Saginaw Steering Systems and vice president of Delphi Automotive Systems. “The benefits to be realized for Delphi and other industries are significant and worthy of the investment.”

Delphi engineers worked with ORNL to apply the material in their heat treat facilities, replacing steel rack assemblies that fail in high heat and result in production delays. The assemblies hold automotive parts to be heat-treated and consist of trays, support posts, and fixtures. Together, Delphi and ORNL developed a nickel aluminide fixture casting process, modified the alloy to optimize its manufacturability and performance under typical heat-treating furnace operating conditions, and tested and evaluated prototype parts. Now, Delphi has made these fixtures standard in their facilities and is in the process of implementing it worldwide.

“The implementation of nickel aluminide into the heat-treating furnace has large potential for energy savings through enhanced component life, a major objective of DOE-supported research,” stated Denise Swink.

“Being able to increase Delphi’s manufacturing productivity and product competitiveness with a technology that can be applied across different U.S. industries, helping the future economic growth of our country, has been a phenomenal project to be a part of,” said Tosch. “We look forward to more

mutually beneficial projects where we can again bring the minds of industry and government together.”

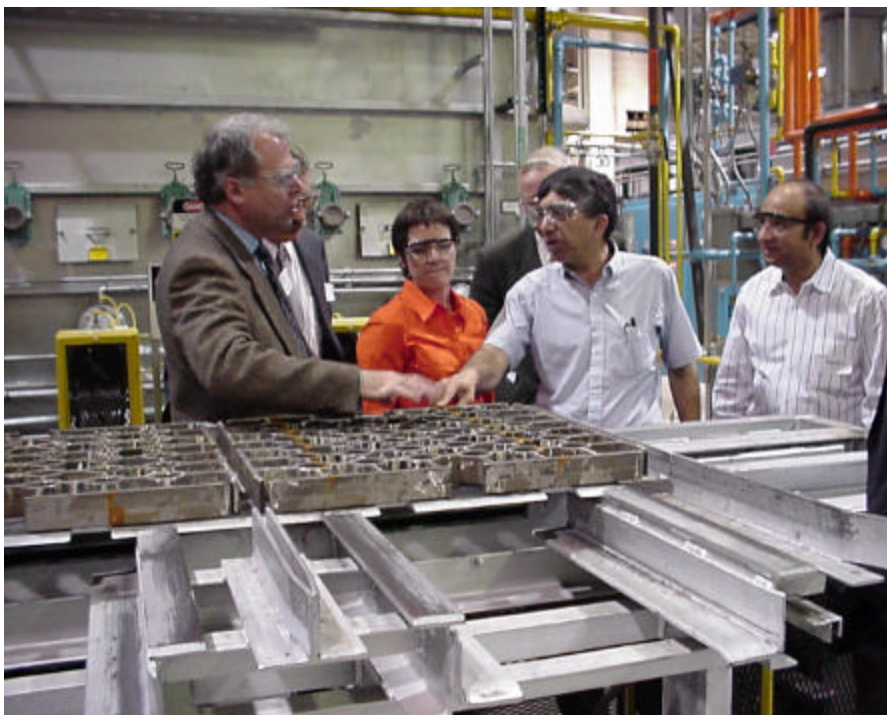
For more information about Delphi Automotive Systems, visit Delphi's Virtual Press Room at www.delphiauto.com/vpr.



Denise Swink, OIT, U. S. DOE and Paul Tosch, President of Delphi Saginaw Division



Denise Swink, U.S. DOE, OIT, Uhricht, Delphi, ; Charles Sorrell, Industrial Materials Program, OIT



Peter Angelini, ORNL, Mike Soboroff, OIT, Denise Swink, OIT, Charles Sorrell, OIT, Vinod Sikka, OIT, Madhu Chatterjee, Delphi

